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# EFFECT OF STOCKING CATCHABLE TROUT ON WILD TROUT POPULATIONS\*

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## ABSTRACT

In 1967, Montana started a trout population study on two sections of the Madison River. We were trying to find out if unusually low spring flows affected the numbers of trout. The flows were regulated by Hebgen Dam.

In 1968 releases from the dam changed and spring flows were improved. However, trout increased in only one of our two study sections. There was only one major difference in management between them. The section which didn't show improvement was being stocked annually with catchables, while the section that improved hadn't been stocked for over 10 years.

In 1970 the study was changed to check on the effect of planting. We continued sampling the two Madison River sections and stopped planting the one that had been stocked annually. We also began sampling two sections of O'Dell Creek, which is a tributary of the Madison. One of the O'Dell Creek sections had been sampled before, the other hadn't. The creek had not been planted for seven years. We began planting one O'Dell Creek section, the other remained unstocked.

By 1971, in the Madison section where we stopped planting, wild trout had increased over 180 percent, both by numbers and by weight. At the same time, in the O'Dell Creek section that we started stocking, wild trout decreased over 45 percent in both numbers and weight. In the O'Dell Creek section that remained unplanted, both number and weight of wild trout stayed about the same. In the Madison River section that has remained unplanted for over 10 years, wild trout have continued to increase. This is probably still in response to the better spring flows the river has had since 1968.

Fish were sampled by electrofishing which was conducted by floating through the study sections. A basic mark-and-recapture method was used to estimate total numbers and pounds. These estimates were made only for two-year-old and older, wild, brown and rainbow trout. Trout were marked with tags in the spring. Return of these tags by fishermen was used to estimate angler harvest. This harvest appeared to drop slightly both in the Madison section where stocking ceased and in the O'Dell section where stocking was started.

\* Data for this paper was collected under Federal Aid projects F-9-R-15 through F-9-R-20.

## Introduction

This trout population study was started on the Madison River and O'Dell Creek in the spring of 1967 and continued through the fall of 1971. The study was initially set up to determine the effects of low spring water flows on Madison River wild trout populations. Later this study developed into the effect of stocking catchable hatchery rainbow trout on wild trout populations.

The Madison River, located in southwestern Montana, originates in Yellowstone National Park and flows approximately 140 miles in a northerly direction, joining the Jefferson and Gallatin Rivers to form the Missouri River (Figure 1). There are two man-made impoundments on the river: (1) Hebgen Reservoir, located three miles downstream from the park boundary, and (2) Ennis Reservoir, located 67 miles downstream from Hebgen Reservoir. O'Dell Creek is a valley spring creek which arises about 11 miles south of Ennis Reservoir.

Hebgen Reservoir storage patterns caused problems with the late-winter and early-spring water flow levels in the Madison River. During the early spring of 1967 and many other previous years, water storage in Hebgen Reservoir would begin in late February and continue through the spring runoff. This left a low water period from late February through mid-May in the river. It was often dewatered as much as 50 percent in some areas. Two study sections were set up on the Madison River, one near the town of Ennis (Varney) and the other below Ennis Reservoir (Norris). Population estimates were made during the spring and fall in Varney and during the spring in the Norris section. Before the 1968 storage was started, the local dam operators agreed to change the storage pattern. The storage would not begin until the spring runoff occurred in mid-May. Thus, from 1968 through 1971 there has been no early spring dewatering and normal flows have occurred. Since the change in water flow patterns, the adult wild trout (browns and rainbows) population in the Norris section has increased 80 percent from 6800 in the spring of 1967 to 12,250 in the spring of 1970. But even with improved flows, the Varney section did not show similar results. The spring 1967 adult wild brown trout population estimate was 1760 and by the spring of 1970 it was 2121, or 21 percent increase.

So some other factor must have been controlling the Varney trout population size. Since the Norris area had the most liberal angling regulations - year around angling versus a closure in Varney from March 1 through mid-May; the best access roads on both sides of the river versus access only on the beginning and the end of the section in Varney; and the highest angling pressure, there was a possibility that the heavy fish stocking in the Varney section (8,000 to 10,000 per year) could be inhibiting the wild trout population size. The Norris section had not been stocked since 1960.

The present catchable trout study was set up during the spring of 1970 on the Varney section of the Madison River and a tributary stream, O'Dell Creek. Three study sections were set up as follows: (1) Varney on the Madison River - since this section had received catchable plants since the early 1950's through 1969, stocking ceased in 1970; (2) lower O'Dell Creek - no stocking had occurred

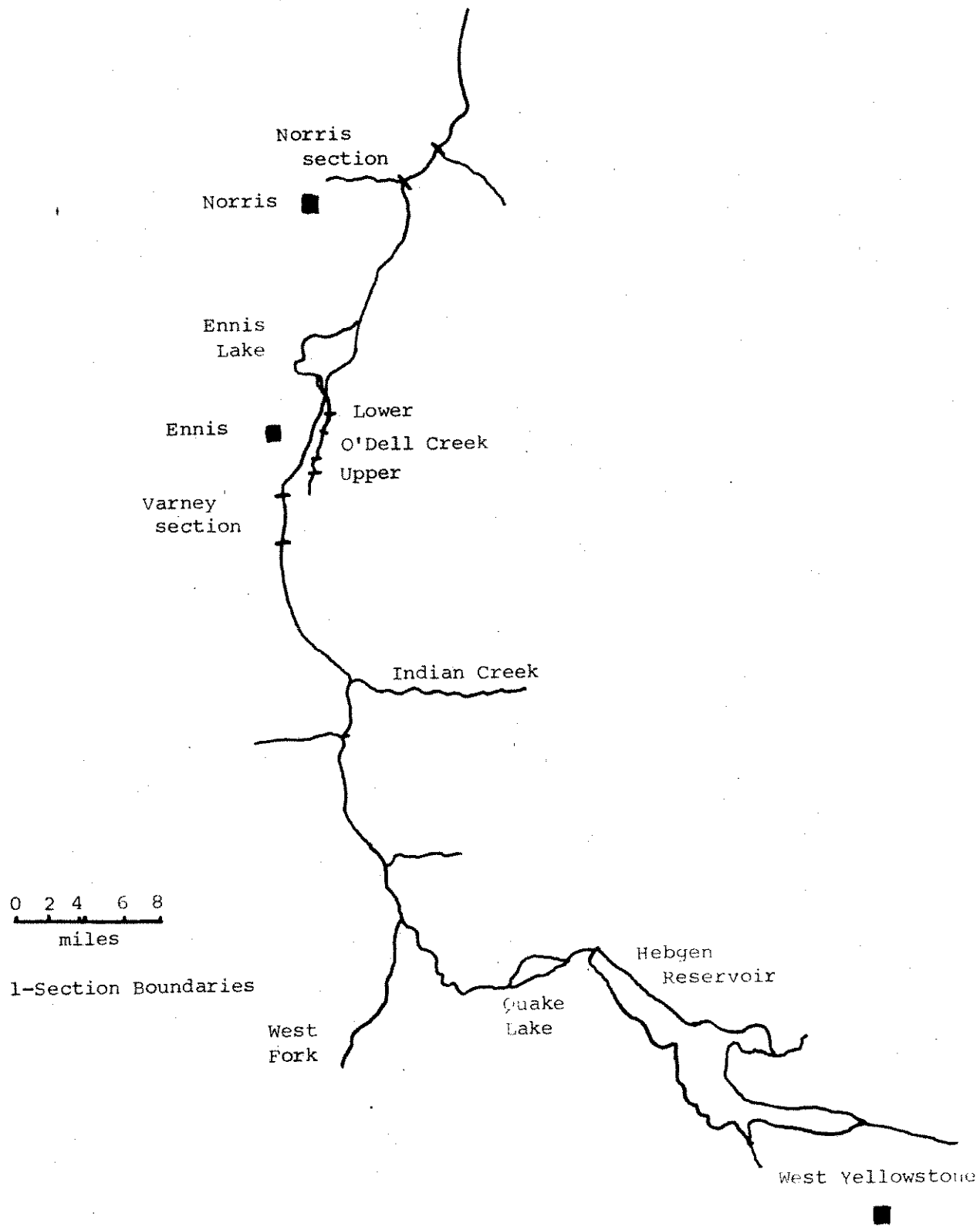


Figure 1. Map of the Madison River and O'Dell Creek showing the study sections.

in this area since 1963, but with the summer of 1970 stocking was initiated; and (3) upper O'Dell Creek - no stocking had occurred since 1963 and this would continue. The Varney section prior to 1970 had received up to 8,000 rainbows annually. In lower O'Dell Creek the experimental plants were 4,000 in 1970 and 4,500 in 1971. Trout population estimates were made on Varney from 1967 through 1971, lower O'Dell Creek from 1967 through 1971 and on upper O'Dell Creek from 1970 through 1971.

### Methods

Electrofishing gear was used to sample fish populations in the Madison River. Electrofishing was carried out while floating through each section of stream in a flat-bottomed fiberglass boat. This boat contained a stationary negative electrode (fastened to the bottom of the boat), a mobile positive electrode, a portable 2500 watt a.c. generator with a rectifying unit which converted the alternating current into pulsed or continuous direct current, a container to retain captured fish, and other gear necessary to weigh, measure and tag the fish. Captured fish were periodically anesthetized with MS 222 (Tricane Methanesulfonate), measured to the nearest 0.1 inch in total length, weighed to the nearest 0.02 pound, tagged with a Floy anchor tag or fin clipped and then released.

Estimates of the trout population (trout two years old and older) were based on the mark-and-recapture technique of Peterson, using Chapman's formula as shown in Ricker (1958). Total number, total biomass, and confidence intervals were calculated for each estimate. The actual mathematical computations were made by an IBM computer programmed to use methods described by Vincent (1971). Angler harvest data was obtained from the use of numbered plastic tags which were inserted in the fish just behind the dorsal fin with the barbs engaging in the pterygiophores. These tags were placed in the fish during the spring estimates. The tags, when returned by anglers, were used to compute a percent angler harvest for a year.

### Results

During the years 1967-1969, when the Varney section was stocked with catchable rainbow trout, the fall wild brown and rainbow trout population estimates ranged from 275/mile in 1969 to 306/mile in 1968 or an average of 294/mile (Tables 1 & 2). The average biomass was 359 pounds/mile. Then in the fall of 1970 after the first summer of no trout stocking in this section, the total numbers of wild trout increased to 549/mile or an increase of 87 percent over the three year average when catchables were stocked. By the fall of 1971 the wild trout number had increased 180 percent to 833/mile. The biomass increased from a three year average of 359 pounds/mile in stocked years to 1,026 pounds/mile in the fall of 1971. This constituted a 186 percent increase.

In the lower study section of O'Dell Creek where no stocking of catchables occurred from 1963 through 1969, the fall brown trout population estimate ranged from 303/mile in 1969 to 428/mile in 1968 or a three year average of 354/mile.

The 1970 fall estimate made after the first summer of catchable stocking showed no appreciable change, but by fall of 1971 after a second summer of stocking, the population decreased 49 percent to 182/mile. This total biomass also showed a similar drop from an average of 338 pounds/mile in nonstocked years to 182 pounds/mile after stocking.

TABLE 1. A comparison of wild brown trout population estimates between years with catchable stocking and years of no stocking. Population estimates are for trout two years old and older. Estimates are expressed as numbers and pounds per mile. Confidence intervals at the 95 percent level are shown in parentheses.

Year	Madison River Varney		O'Dell Creek Lower		O'Dell Creek Upper	
	No.	Lbs.	No.	Lbs.	No.	Est.
	Stocking		No stocking		No stocking	
1967	253 (+93)	353	331 (+92)	317	-	-
1968	225 (+70)	279	428 (+107)	404	-	-
1969	239 (+75)	298	303 (+58)	292	-	-
	No stocking		Stocking			
1970	364 (+87)	561	390 (+64)	345	344 (+52)	405
1971	615 (+156)	790	182 (+33)	182	367 (+86)	406

TABLE 2. A comparison of wild rainbow trout populations between years of catchable stocking and years with no stocking on the Varney section of the Madison River. Estimates are for trout two years old and older. Estimates are expressed as number and pounds per mile with confidence intervals at the 95 percent level shown in parentheses.

	1967	Stocking		No Stocking	
		1968	1969	1970	1971
No.	48 (+20)	81 (+62)	36 (+26)	185 (+113)	218 (+89)
Lbs.	24	84	39	169	236

The control section on O'Dell Creek (upper) showed only a slight increase in total numbers from 344/mile to 367/mile. This constituted a 7 percent increase in total numbers.

Angler tag return rates showed a steady 11-12 percent return in stocking years on the Madison, with a slight drop of 2-3 percent in 1970 and 1971 after stocking ceased. In the lower O'Dell Creek section there was a slight drop after stocking was initiated in 1970 and 1971. The unstocked section of O'Dell Creek showed a slightly higher return rate than the stocked section in 1970 and 1971.

TABLE 3. Angler tag return rates of wild brown trout for the stocked and unstocked years in the Madison River and O'Dell Creek. Numbers are expressed as percent of total tagged in the spring.

Year	Madison River Varney	O'Dell Creek Lower	O'Dell Creek Upper
	Stocking	No Stocking	No Stocking
1967	12.8%	5.7%	-
1968	11.0%	9.4%	-
1969	12.1%	1/	-
	No Stocking	Stocking	
1970	8.6%	4.6%	5.9%
1971	9.3%	3.7%	8.8%

1/ Insufficient data for computation

### Discussion

The stocking of catchable rainbow trout is commonly used with the idea of maintaining or improving trout harvest. The idea was to supplement the wild trout harvest with some additional hatchery trout. It was assumed that these additional trout would have no detrimental effect on the existing wild trout populations.

This study has shown that when hatchery-reared rainbow trout are added to existing self-sustaining wild trout populations, the wild trout numbers decrease drastically within the first two years after stocking starts. Abnormal mortality rates occur both in the summer and winter periods. This study has also shown that in O'Dell Creek the stocked rainbow adds little to the overall population size, because of an annual mortality rate exceeding 99 percent. When stocking of catchables ceased in the Varney section of the Madison River, the wild trout population was able to almost triple in two years.

Angler tag returns indicated that none of the three study sections exhibited enough angling pressure to affect the total population size.

The angler harvest was less than 20 percent of the annual mortality. The slight decrease in angler harvest (2-3%) on the Madison section could not account for the large population increase (180%). Lower O'Dell Creek also had a decrease in angler harvest, but the population decreased 50 percent instead of increasing. The upper section of O'Dell Creek which did not receive catchables had a lighter harvest rate than the lower stocked section, but the population remained about the same. All of this information would indicate that factors other than angler pressure control the trout population sizes in these streams.

A possible reason why the losses in wild trout occur could be due to some social stress involving space and/or food. The stocked section of O'Dell Creek showed some signs of this stress-increased movement, decreased condition factor and a decreased growth rate over previous unstocked years. The changes were not noted in the unstocked section of O'Dell Creek.

#### LITERATURE CITED

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